Chemical & Engineering NEWS
October 31, 1982

Chemical plant capacity use stays low
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# Mid-term elections

The stake for science and business
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# Chemical & Engineering NEWS

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# BIG CHANGES IN CHEMICAL FIRMS BY 2000

By the year 2000, as many as 10 of today's top 30 chemical companies won't be around "as we currently know them," says Frank P. Popoff, president of Dow Chemical Europe. The survivors, he adds, will have been drastically restructured.

In a speech to members of the Chemical Manufacturers Association, given at CMA's meeting in Chicago, Popoff reminded his audience that the malaise now affecting the chemical industry worldwide has been a reality in Europe since mid-1980. Since then, "prices have been depressed and the economy has been in the grip of recession, with chemicals joining steel, textiles, transportation, autos, and construction as one of the 'sick industries' of Europe."

The problems are well known, Popoff says. Poor growth rates are forecast for the remainder of the decade. "Negative volume growth" has been a reality for numerous commodities last year and this year. "The overcapacity is enormous," the Dow executive observes. For example, Western Europe currently has about 16 million tons of ethylene capacity but only about 10.5 million tons of ethylene demand. The situation is similar for thermoplastics. At the same time, costs have continued to climb.

The role of governments in the chemical industry currently is receiving a great deal of attention, Popoff says. "Regrettably, this attention is fully warranted." Nationalization, either official or de facto, is commonplace.

Already, Popoff says, government enterprises have replaced the major oil companies as the leading threat to traditional chemical producers. "The motivations of governments in the chemical industry are a far cry from those of the oil companies," he contends. "They concern themselves with employment and foreign exchange management, rather than upgrading their crude."

By late 1980, the inevitability of structural change in the world's chemical process industries was evident, Popoff says. So, "well before the impact of our current problems, we in Dow Europe initiated a study in an attempt not only to look at inanimate factors such as growth rates, cost structures, processes, feedstock alternatives, and the like, but also to take a look at the number, character, and location of the firms who in the future would be producing the bulk of commodity chemicals. These firms would be the largest in terms of size—but not necessarily giants in terms of profitability.

*Popoff: survivors will be restructured*

"We determined that by the year 2000, as many as 10 of today's top 30 firms would not be around as we currently know them, by virtue of mergers, acquisitions, rationalization, and nationalization." Also, "instead of all the top 20 firms being in Western Europe and the U.S., 10 of the top 20 could be emerging elsewhere."

That study was "contentious" when it was made, but it seems less so each day, Popoff says. "The Japanese already have made the list. Canada and Saudi Arabia have investment programs that could propel them rapidly. New concerns are emerging as national enterprises, through raw material strengths and ambitions. Existing concerns are exiting through rationalization, nationalization, necessity, or decision to pursue other alternatives."

As to possible solutions to the problems, Popoff notes that, despite all efforts, "we seem to have only marginal impact on government policies, the price of oil and feedstocks, interest and foreign exchange rates, and the ability of industry and the consumer to finance demand." Thus, he concludes, "we are well advised to concentrate on those issues we can impact; specifically, product mix, customer mix, price, and restructuring."

Popoff lists the essential elements of the "rationalization" that he says the chemical industry must undertake to strengthen prices and restore profitability: "Shut down overcapacity. Restrict efforts to businesses where our technology allows for demand creation and cost reduction. Divest businesses that don't fit. Modify product and customer mix to emphasize demand growth opportunities. Long range, emphasize manufacturing, marketing, and, especially, research and development efforts that fit the new objectives."

This rationalization is taking place already, in hydrocarbons, heavy organics, chlor-alkali, and thermoplastics, Popoff says. But, he adds, it's not happening fast enough.

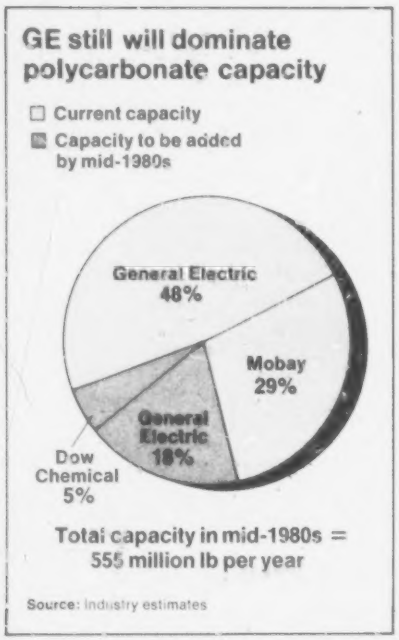
Popoff observes that U.S. chemical producers, threatened in the area of commodities, are "grasping at every opportunity in the area of specialties." In fact, he warns, "if all of us do all that we have said we will in the field of chemical specialties, the result—even in a field as broad as specialties—will be horrible overcapacity. However, if we make the right choice on our relative merits, then innovation can be rewarded and the 'me too' syndrome, so damaging to commodities, can at least be avoided in specialties." □

## Dow plans to enter polycarbonate market

Dow Chemical's board of directors has given the go-ahead for the company to enter the polycarbonate market.

Dow has been operating a semicommercial plant to test the market, but the authorization by the board will permit the company to build a 30 million lb-per-year polycarbonate plant. It will be located at the company's Texas division in Freeport. The plant is scheduled to begin production in early 1985.

When the plant is started up, Dow


GE still will dominate polycarbonate capacity
Current capacity
Capacity to be added by mid-1980s
General Electric 48%
Mobay 29%
General Electric 18%
Dow Chemical 5%
Total capacity in mid-1980s = 555 million lb per year
Source: Industry estimates

will become only the third commercial U.S. producer of polycarbonates. General Electric and Mobay are the other two.

Dow, with its 30 million-lb plant, will be the smallest of the three. General Electric has a current estimated annual capacity of about 265 million lb; Mobay has an estimated capacity of about 160 million lb. However, between 25 million and 30 million lb of Mobay's capacity was closed earlier this year. A spokesman for Mobay says the shutdown is for an indefinite period, but this capacity could come back on stream if the market improves.

Apparently the market will have to improve if anyone is going to do very well. Current U.S. capacity totals about 400 million lb. However, Dow estimates that total U.S. consumption last year was only about 240 million lb. Dow says polycarbonate consumption is expected to grow about 7 to 8% per year.

At that rate, it will take some time before consumption catches up with current capacity, let alone what is scheduled to come on stream in the middle of the decade.

Besides Dow's 30 million lb slated for 1985, General Electric has a planned expansion of 100 million lb to its Montgomery, Ala., plant on the boards. This expansion originally was scheduled for 1985, too, but General Electric has delayed it for at least a year.

Industry observers say that exports of polycarbonate were about 50 million lb in 1981. Most of this went to Japan, almost all from General Electric.

Dow's plan seems to be to take some market share away from current producers, and also to develop some of its own specialty niches through developmental work. □

## Gulf restarting plant after extortion attempt

Gulf Oil Chemicals expects to be well on the way toward a complete restarting of its bomb-threatened plant at Cedar Bayou, Tex., this week.

The plant was shut down in late September after a group attempted to extort $15 million from the company by placing bombs in the plant. Startup of the unit began on Oct. 5 and is expected to require about two weeks.

A Gulf Oil Chemicals spokeswoman confirmed that it cost $1.5 million to shut down and restart the plant and that losses ran about $300,000 for each day the plant didn't operate. Total costs for coping with the extortion attempt therefore will run between $4 million and $5 million.

The Cedar Bayou plant, largest of Gulf Oil Chemicals' plants, produces ethylene, propylene, and derivatives such as polyethylene, polypropylene, and alpha-olefins. Initial production of ethylene and propylene began in late 1963. Expansions to original capacity and addition of other products on the Cedar Bayou site, which covers more than 1000 acres, has increased employment to 1100.

Five of the 10 explosive devices threatened for the plant in letters to the company from the extortion group were found Sept. 30. Four were disarmed and the other exploded harmlessly. The remaining devices apparently were not put into place.

Employee safety was the paramount reason for shutting down the plant. After shutdown, only a small number of employees stayed at the plant doing security and maintenance work.

Lost production at the Cedar Bayou plant did not keep Gulf from meeting its contracts for sale of the various chemicals, according to an official. Inventories are judged sufficient to cover sales commitments along with product exchange agreements. □

## Progress in nonanimal cosmetic irritancy test

Two scientists at Rockefeller University are making progress toward a nonanimal test for irritancy of cosmetics' ingredients. Their work could lead to a replacement for the Draize test used now.

Animal rights activists have objected to the Draize test, in which the substance tested is put into one eye of a live rabbit and the degree of irritation is judged by comparison with the other eye.

Biochemistry professors Ellen Borenfreund and Charles Shopsis of the university disclosed their findings to a New York Academy of Sciences conference on cellular systems for toxicity testing. The Rockefeller investigators are correlating literature results in the Draize test to either uptake of radioactive uridine or light microscopic observations in cell cultures. They use either a mouse fibroblast cell culture called 3T3 or a human liver cancer cell line called Hep $G_2$.

Compounds tested to date in order of increasing severity of irritation in the Draize test are methanol, propylene glycol, ethanol, isopropanol, tetrahydrofuryl alcohol, *tert*-butanol, allyl alcohol, 1-pentanol, and 1-octanol. The research is supported by a three-year, $750,000 grant from Revlon (C&EN, Jan. 5, 1981, page 21).

For tritiated uridine uptake, the biochemists measure either volume

*In-vitro test for irritancy of cosmetics would replace rabbit eye testing*

# Chemical capacity use remains depressed

**Plant operating rates edge up to 63% in chemicals and 69% in polymers; permanent shutdowns lower capacity 2% as output falls 19%**

William F. Fallwell, C&EN Washington; Bruce F. Greek, C&EN Houston

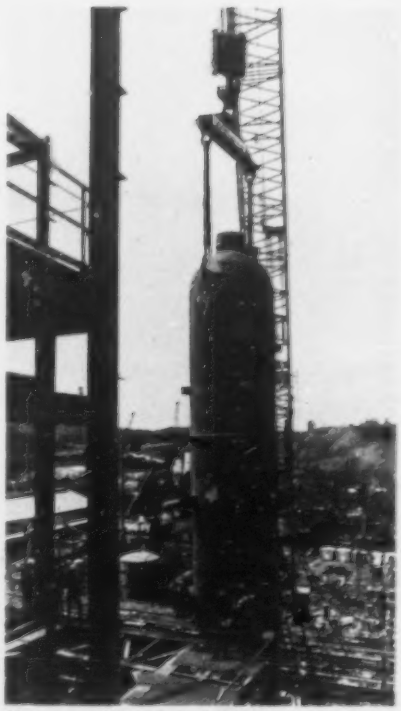
Tricky as they are to follow, especially in a chaotic year like this one, plant use rates are enormously informative on the state of the industry's health. At present, they provide a high-resolution x-ray of a patient in pain.

With the usual generous help from experts all over the industry, who scarcely relish discussing the current scene, C&EN has put together its latest semiannual scan of capacity use, for mid-1982, in the most important U.S. basic chemicals and polymers. The results etch out somewhat the same stark pattern as six months ago but with some important differences.

Plant use is still shockingly, historically low. However, the management reaction hinted earlier this year now is in full swing. Companies are applying stiff medicine in the form of plant shutdowns. Although conservative in counting these as permanent, C&EN's tally still shows an overall drop in the industry's production capability, possibly the first since World War II. This decline accounts for nearly all the industry's slight uptick in capacity use since the beginning of the year.

Specifically, the key points emerging from the welter of data show:

- Nameplate capacity use in 32 basic chemicals has inched up to 63% from a revised 61% early in the year. However, plant use still is far below its 72% rate a year ago and the recent high point of 81% in mid-1979.
- Nameplate capacity use in 11 basic polymers has moved up similarly to 69% from 66% last winter. But the latest reading is still way down from 81% in mid-1981 and the last peak of 85% in early 1980.
- Effective capacity use also has climbed lately, to 69% in basic chemicals and 75% in polymers, after hit-



*Huge gasifier is hoisted into place at Tennessee Eastman's chemicals from coal project in Kingsport, Tenn.*

**Plant use has pulled up slightly in plastics and synthetic fibers**

| Billions of lb per year | Third-quarter 1982 Capacity (nameplate) | Third-quarter 1982 Capacity use Nameplate | Third-quarter 1982 Capacity use Effective | First-quarter 1982 Capacity (nameplate) | First-quarter 1982 Capacity use Nameplate | First-quarter 1982 Capacity use Effective | Third-quarter 1981 Capacity (nameplate) | Third-quarter 1981 Capacity use Nameplate | Third-quarter 1981 Capacity use Effective |
|---|---|---|---|---|---|---|---|---|---|
| **Plastics** | | | | | | | | | |
| **Polyethylene, low density** | 9.3 | 76% | 81% | 9.7 | 71% | 76% | 9.0 | 84% | 89% |
| **Polyvinyl chloride** | 7.8 | 64 | 74 | 8.0 | 62 | 72 | 8.1 | 75 | 87 |
| **Polyethylene, high density** | 6.1 | 82 | 86 | 6.0 | 66 | 69 | 6.0 | 83 | 87 |
| **Polypropylene** | 5.1 | 61 | 68 | 5.1 | 67 | 74 | 5.1 | 80 | 89 |
| **Polystyrene**[a] | 5.3 | 60 | 71 | 5.4 | 53 | 62 | 5.7 | 60 | 71 |
| **AVERAGE** | | **69%** | **76%** | | **64%** | **71%** | | **76%** | **85%** |
| **Synthetic fibers** | | | | | | | | | |
| **Filament yarn** | | | | | | | | | |
| Polyester | 1.6 | 75 | 81 | 1.8 | 74 | 79 | 1.8 | 93 | 99 |
| Nylon | 2.0 | 64 | 68 | 2.0 | 60 | 64 | 1.9 | 84 | 89 |
| Olefin | 0.99 | 60 | 64 | 0.99 | 64 | 68 | 0.94 | 69 | 73 |
| **Staple** | | | | | | | | | |
| Polyester | 2.8 | 62 | 66 | 2.8 | 77 | 82 | 2.7 | 97 | 103 |
| Nylon | 0.99 | 76 | 81 | 1.0 | 56 | 60 | 0.97 | 94 | 100 |
| Acrylic | 0.84 | 82 | 87 | 0.84 | 71 | 76 | 0.83 | 79 | 84 |
| **AVERAGE** | | **70%** | **75%** | | **67%** | **72%** | | **86%** | **91%** |
| **OVERALL AVERAGE** | | **69%** | **75%** | | **66%** | **71%** | | **81%** | **88%** |

a Between 5 and 10% of this capacity is shut down. **Sources:** Industry sources, Society of the Plastics Industry, Textile Economics Bureau, C&EN estimates

ting bottom at 66% and 71%, respectively, in the first quarter. Effective capacity, almost always less than nameplate, is maximum plant output estimated by industry experts after allowing for changes in product mix, corrosion, unplanned maintenance, and other influences.

• Behind the capacity use figures, production has stayed virtually flat in basic chemicals this year and for polymers has risen just 3% since winter. Over the past 12 months, production has fallen a depressing 19% in basic chemicals and 14% in polymers. Nameplate capacity has fallen 2% in both areas over the past six months. Compared to a year ago, capacity also is down 2% in basic chemicals and level in polymers.

So, plant-use levels support the widespread industry belief that the recession has touched bottom but has not yet yielded to recovery. Although financial markets have improved greatly this summer and will keep right on gaining—in the opinion of analysts such as Du Pont's chief economist Charles B. Reeder—the state of real business is still poor.

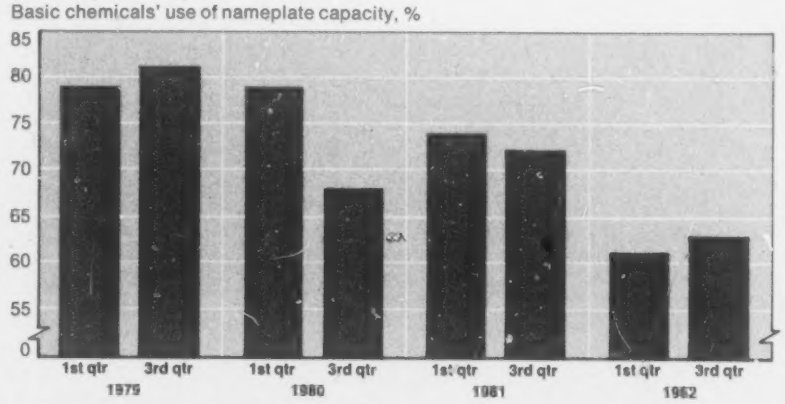
## Effective plant use in basic chemicals edges up to 69%

| Billions of lb per year unless otherwise noted[a] | Third-quarter 1982 | | | First-quarter 1982 | | | Third-quarter 1981 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Capacity (nameplate) | Capacity use | | Capacity (nameplate) | Capacity use | | Capacity (nameplate) | Capacity use | |
| | | Nameplate | Effective | | Nameplate | Effective | | Nameplate | Effective |
| **Petrochemicals—olefins and aromatics**[b] | | | | | | | | | |
| **Ethylene** | 39.0 | 61% | 68% | 39.7 | 56% | 62% | 41.0 | 65% | 72% |
| **Propylene** (chemical and polymer) | 23.5 | 55 | 61 | 23.5 | 43 | 47 | 23.5 | 59 | 66 |
| **Butadiene**[c] | 4.4 | 40 | 44 | 4.6 | 42 | 47 | 4.6 | 67 | 74 |
| **Benzene** (bg) | 2.4 | 48 | 53 | 2.5 | 42 | 47 | 2.7 | 67 | 74 |
| ***p*-Xylene** | 4.9 | 60 | 63 | 4.9 | 61 | 64 | 5.6 | 64 | 67 |
| **Petrochemicals—$C_1$ derivatives** | | | | | | | | | |
| **Ammonia** (mt)[d] | 20.8 | 78 | 82 | 20.8 | 80 | 84 | 24.0[d] | 80 | 84 |
| **Urea** (mt)[d] | 8.1 | 69 | 77 | 8.1 | 63 | 70 | 8.0 | 90 | 100 |
| **Methanol** (bg) | 1.6 | 76 | 84 | 1.5 | 72 | 80 | 1.4 | 83 | 92 |
| **Formaldehyde** (37% solution) | 8.9 | 47 | 49 | 8.9 | 51 | 54 | 8.9 | 65 | 68 |
| **Chlor-alkalies** | | | | | | | | | |
| **Chlorine** (mt) | 14.6 | 64 | 67 | 14.7 | 62 | 65 | 14.8 | 78 | 82 |
| **Caustic soda** (mt) | 15.6 | 61 | 64 | 15.6 | 59 | 62 | 15.5 | 75 | 79 |
| **Soda ash** (mt) | 10.9 | 73 | 77 | 10.4 | 76 | 80 | 10.0 | 83 | 87 |
| **Acids** | | | | | | | | | |
| **Sulfuric** (mt) | 59.6 | 49 | 52 | 59.4 | 54 | 57 | 58.5 | 74 | 78 |
| **Phosphoric** ($P_2O_5$, mt)[e] | 12.6 | 64 | 67 | 12.4 | 62 | 65 | 11.5 | 91 | 96 |
| **Industrial gases** | | | | | | | | | |
| **Oxygen**, **Nitrogen** (total, liquid, ttd) | 36.6 | 65 | 82 | 37.6 | 64 | 80 | 36.0 | 66 | 83 |
| **Carbon dioxide** (ttd) | 18.4 | 67 | 75 | 17.7 | 63 | 70 | 16.4 | 17 | 80 |
| **Mineral-based inorganics** | | | | | | | | | |
| **Sulfur** (total, mlt) | 15.8 | 53 | — | 15.7 | 61 | — | 16.0 | 68 | — |
| **Potash** (mt) | 2.7 | 74 | — | 2.7 | 84 | — | 2.9 | 76 | — |
| **Phosphorus** (mt) | 0.55 | 68 | 72 | 0.55 | 66 | 69 | 0.55 | 78 | 82 |
| **Plastics monomers** | | | | | | | | | |
| **Styrene** | 8.7 | 69 | 81 | 8.7 | 79 | 93 | 8.9 | 74 | 87 |
| **Vinyl chloride** | 10.0 | 68 | 76 | 9.6 | 50 | 56 | 9.7 | 70 | 77 |
| **Toluene diisocyanate** | 0.73 | 73 | 81 | 0.73 | 74 | 82 | 0.73 | 81 | 90 |
| **Fiber monomers** | | | | | | | | | |
| **DMT-PTA**[f] | 7.3 | 56 | 66 | 7.3 | 58 | 68 | 7.3 | 71 | 83 |
| **Ethylene oxide** | 6.8 | 67 | 74 | 6.8 | 68 | 76 | 6.8 | 72 | 80 |
| **Cyclohexane** | 3.1 | 37 | 39 | 3.1 | 33 | 35 | 3.4 | 59 | 62 |
| **Adhesives and coatings monomers** | | | | | | | | | |
| **Phenol**[g] | 3.6 | 61 | 68 | 4.0 | 56 | 62 | 4.0 | 67 | 74 |
| **Vinyl acetate** | 2.3 | 91 | 96 | 2.4 | 72 | 76 | 2.4 | 79 | 83 |
| **Pigments** | | | | | | | | | |
| **Carbon black** | 3.4 | 62 | 69 | 3.4 | 75 | 83 | 3.4 | 82 | 91 |
| **Titanium dioxide** (mt) | 1.0 | 61 | 72 | 1.0 | 53 | 62 | 1.0 | 82 | 96 |
| **Solvents** | | | | | | | | | |
| **Acetone**[g] | 3.3 | 53 | 59 | 3.6 | 59 | 66 | 3.6 | 58 | 65 |
| **Ethanol** (mg) | 240 | 75 | 79 | 270 | 50 | 53 | 270 | 56 | 59 |
| **Methylene chloride** | 0.83 | 63 | 70 | 0.83 | 54 | 60 | 0.83 | 64 | 71 |
| **AVERAGE** | | **63%** | **69%** | | **61%** | **66%** | | **72%** | **79%** |

a bg = billions of gal, mt = millions of tons, tt = thousands of tons, ttd = thousands of tons per day, mlt = millions of long tons, mg = millions of gal. b About 25% of ethylene and lesser amounts of other capacity currently is shut down because of weak markets. c Total extraction capacity, which runs about 25% more than basic production capacity. d Some capacity, possibly 15%, shut down. e Includes both wet-process and furnace-process capacity. f Dimethyl terephthalate and purified terephthalic acid, not including acid converted to DMT. g Up to 10% of capacity currently shut down. **Sources:** Industry and government sources, C&EN estimates

## Capacity use still is very low

Basic chemicals' use of nameplate capacity, %




Sources: Industry and government data, C&EN estimates

Roughly one third of the chemical industry's productive capacity is idle, and the low growth generally forecast for the 1980s would seem to put high-profit plant-use levels far in the distance.

But possibly not so far as the figures first indicate. The power of adjustment must not be underestimated. Company planners have shut down plants and chopped new investment aggressively in many products. The C&EN survey is slow to acknowledge many of these shutdowns. In other words, many plants now considered down temporarily, such as an estimated 8 billion lb per year in ethylene and 2 billion lb in conventional low-density polyethylene, may never restart.

And strange as it may sound after three no-growth years pockmarked with recession, the battered U.S. economy may yet give the chemical industry a fresh boost. If the current spurt in stock and bond prices on Wall Street is typical, it is predicting recovery in the manufacturing world in early 1983. Reeder at Du Pont doesn't think the early stages of this recovery will be vigorous, but he says emphatically that the last impediment to recovery, high interest rates, now is being overcome. Once recovery is under way, the pinched state of chemical inventories could lever production through several quarters of above-average growth.

Hence, C&EN plant-use surveys in 1983 could show a rapid change in capacity use. For the moment, however, the industry is grinding through an ugly year. Although the damage to plant use has been nearly universal, some product groups are in much worse shape than others.

One of the disaster zones is bedrock petrochemicals, where capacity use averages just over 50%. Industry analysts now believe that 2 billion lb per year of ethylene capacity is shut down for good, bringing the official total down to 39 billion lb. However, perhaps another 8 billion lb is out of production temporarily, and some of this may stay that way. That means the average use rate of plants in operation is roughly 75%, well above C&EN's listed average of 61%.

The $C_1$-based petrochemicals derived from natural gas also have been hit hard this year, averaging 68% capacity use, as markets have suffered in fertilizer and construction. In ammonia, for example, C&EN already had deleted 3.2 million tons per year of capacity by early 1982 because of permanent shutdowns, lowering the capacity total to 20.8 million tons. But industry sources now advise that many more plants, possibly 15%, have closed down in the current recession.

In methanol, a high-performing product in the late 1970s, the capacity situation is ominous. Plant use is down to 76% from 83% a year ago. That wouldn't be too bad by itself. But unfortunately, the product is in a capacity binge, one of the few in the chemical world at the moment. U.S. capacity is moving up steadily this year with more due shortly, and huge new capacity looms from Canada.

Derivatives of methanol and ammonia also are in trouble. Urea suddenly lost its export punch in late 1981, and capacity use here has plummeted from 90% in mid-1981, one of the best in the industry, to the present 69%. Plant closings have struck.

In the inorganic sphere, many crucial products have had similar fates. The chlor-alkali group entered 1982 with a massive problem in chlorine, now running at 64% of capacity.

## C&EN's capacity-use indicator—the ground rules

Capacity use at chemical plants is difficult to measure and requires certain assumptions. These bring some order to the maze of variables affecting this critical indicator of the industry's health.

With the help of industry and government sources, C&EN measures capacity use as a percentage of both nameplate and effective maximums. Nameplate capacity is the official design capacity of plants. Effective capacity is the practical maximum after reductions for unplanned maintenance, corrosion problems, changes in product mix, and other influences. Although engineering companies and industry statistics groups try to make nameplate capacity data as "real" as possible, practical problems almost always reduce effective maximums to 85 to 95% of the official totals. For short periods, plants can run more than 100% of effective top capacity, but such a rate won't last more than a few months.

Capacity use is given over as much of a calendar quarter as production data permit, with no seasonal adjustment. The figures are for plants actually running. At present, some products such as ethylene, phenol, polystyrene, and urea have plants temporarily shut down because of weak markets. These plants still are included in capacity totals. The totals exclude new plants just starting up and old plants out of operation for long periods because of accidents. As much as possible, capacity figures stay current with expansions.

Capacity data don't take into account other temporary fluctuations for fuel and electric power interruptions, equipment failure, and feedstock scarcity or substitution. The feedstock variables have been important in the past few years in ethylene production, further reducing maximum output for several coproducts such as propylene, butadiene, and benzene.

Products in C&EN's capacity-use survey are the same as those in the Key Chemicals and Key Polymers series. These are the core products of the industry, the building blocks leading to downstream production of thousands of more specialized products.

Later compounded by a steep price drop in its formerly robust coproduct, caustic soda, the chlorine crisis has led to the first wave of many expected plant shutdowns. Capacity is receding steadily.

Soda ash, mined mostly in Wyoming, also is sagging in capacity use, falling to 73% in the new survey from 83% a year ago. Here, matters are made worse by large new capacity at Tenneco. Although this product may get another new round of investment by the mid-1980s, the capacity buildup is nearly over for the moment.

Two other large volume inorganics, sulfuric and phosphoric acids, have been tripped up by the big market dip in downstream phosphate fertilizer. Although capacity is moving up a bit in both acids, plant use has tumbled hard—from a lofty 91% a year ago to the present 64% in phosphoric and from 74% to a miserable 49% in sulfuric. Industry sources say as much as 25% of phosphoric acid capacity in its Florida heartland could be shut down.

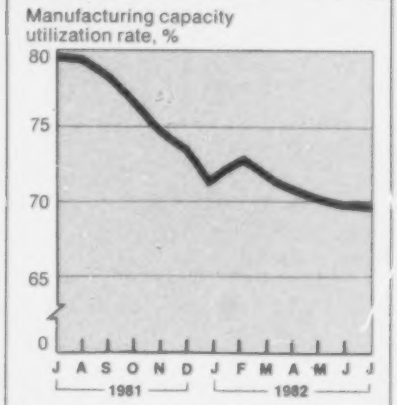
In the mineral inorganics, sulfur has joined the recession in the past half year, finally hit by the sag in derivative sulfuric acid. Prices are falling after a long rise, and plant or mine use has slipped to 53% from 68% in mid-1981. Sulfur capacity still is rising, even though some mines are playing out, because desulfurizing capacity is rising at oil refineries.

To round out the basic inorganics, the industrial gases also have begun to reflect recessionary pressures. Their plant building spree of the past several years is beginning to look suspect as capacity use stays in the mid-60s in percentage. Still, these companies have set up a countercurrent of closings in old plants that has resulted in a rare capacity decline for merchant liquid oxygen and nitrogen. In carbon dioxide, vigorous investment continues in new plants. Capacity is well up this year, with capacity use fluctuating around 70%.

Downstream from these basic inorganics and organics, the large group of organic intermediates is not doing well. Plant use in starting materials for plastics, fibers, adhesives, and coatings is slightly below the industry average at 65%. New capacity addition practically has stopped, and capacity erosion has set in for styrene and phenol.

Note, however, that vinyl acetate, with little new capacity in recent years and fairly stable production in the recession, outranks all other basic chemicals and polymers with a mid-1982 plant use rate of 91%. For the year, the product's analysts forecast a slightly lower average capacity use of 83%.

**Capacity use has dropped sharply in all manufacturing**




Source: Federal Reserve Board

In the remaining basic chemicals, big-volume pigments are languishing at capacity use just over 60%. However, effective capacity in titanium dioxide is much less than nameplate, no more than 85%. And shutdown came after the C&EN survey period at NL Industries' plant at Sayreville, N.J.

Solvents similarly are having a poor year with average capacity use of 64% for acetone, ethanol, and methylene chloride. Although capacity has declined for synthetic ethanol, massive new capacity looms in fermentation ethanol, whose nameplate total has more than doubled in the past year to nearly 500 million gal per year. Some of this fermentation product has seeped into synthetic ethanol markets, worsening the glut.

In polymers downstream from organic intermediates, 1982 has been rough. In the big thermoplastics, production is up 5% from early in the year and capacity conservatively down 2%. Capacity use has picked up to 69% from 64% last winter. But the financial picture is gloomy, and more permanent plant closings are expected in low-density polyethylene and polyvinyl chloride.

Synthetic fibers have lost their bright prospects of a year ago, when capacity use outran all other major industry groups at 86%. Production has fallen a thumping 23%, but capacity is still up a bit. Capacity use is down to 70%. □

## Company formed to clean up Lakeway site

Bofors Nobel has joined forces with two other companies, Zimpro and Chemical Waste Management, to establish a new firm, Environmental Systems Corp. (ESC). ESC's function will be to build and run a $20 million facility to treat chemical wastes—both old and new—from Bofors Nobel's Lakeway plant at Muskegon, Mich.

When Bofors bought Lakeway in 1977, it also bought some severe environmental problems. Soon it was discovered that wastes from the manufacture of a variety of chemicals—accumulated over the years and stored at the site—were being leached from landfills and were contaminating groundwaters.

There followed several years of litigation with Michigan authorities. From the negotiations came a 1981 agreement, the essence of which was that Bofors Nobel would clean up the old Lakeway mess and would make no new messes. According to Bofors Nobel, cleaning up the old mess will involve detoxifying about 175,000 cu yd of contaminated sludges and soils, and also intercepting and treating of more than 1 million gal of contaminated groundwater per day.

The ESC plant will use several waste treatment technologies. Heart of the system is a Zimpro-licensed PACT (powdered activated carbon treatment) unit that will detoxify contaminated groundwaters and also process aqueous wastes and scrubber effluents from the plant.

A multiple-hearth pyrolyzer will detoxify contaminated sludges and soils and biomass from the PACT unit and also will recover fuel values. Char from the pyrolyzer will go to secure landfills.

A wet air oxidation unit, also from Zimpro, will detoxify other waste streams and also will regenerate spent carbon from the PACT unit. Another unit will use proprietary technology to neutralize and detoxify waste acid streams.

Even after the site contamination is cleaned up (about nine years), the ESC facility won't be a white elephant, Bofors Nobel says. It will continue to treat wastes from ongoing manufacturing operations, and it also will permit the company to expand its specialty and custom chemical businesses. ESC also eventually may market its know-how to other companies facing similar problems. □

# Slump hits Mexican chemical industry

**Since late summer, chemical demand and production have slowed sharply owing to drastic turndown in the country's economy**

Earl V. Anderson
C&EN, New York

Last month, Mexico's major chemical trade association abruptly canceled its annual forum shortly before it was scheduled to be held. "Too many companies couldn't afford to send delegates to the meeting," says Carlos Pani, director general of the Asociación Nacional de la Industria Quimica (ANIQ).

That just about says it all about the situation in which the Mexican chemical industry finds itself today. It, along with all other Mexican industries, is in trouble—big trouble. And only the most optimistic of industry officials believe that the situation stands a chance of improving by the middle of next year. Most others believe it will take much longer for the industry to pull itself back onto the fast-growth track that made it the talk of the international chemical community.

In fairness, the Mexican chemical industry is the victim of circumstances beyond its own control. The Mexican economy is shattered. Inflation is soaring above 100% per year. Unemployment is running about 25% and figures to get worse. Two devaluations have shrunk the value of the peso to a third of what it was early this year.

Mexico has the highest foreign debt of any country in the world—about $80 billion—and precious little foreign exchange to pay it or the interest on it. Controls have been imposed on this scarce foreign exchange. The government has clamped tight reins on imports. And last month, it nationalized the banks.

All of this is a bitter change for a country that, until this year, had been fueling an economic boom with its new-found oil wealth (and plenty of borrowed money).

Nowhere is the change more apparent than in Mexico's chemical industry. Through the first half of the year, chemical output in Mexico held up fairly well. But in late August and early September, it was as if the industry stepped out of one world and into another, much bleaker one. Since then, the nation's economy, chemical demand, and chemical production have started grinding to a halt.

Petroleos Mexicanos (Pemex), the national oil giant that, by law, has a monopoly on basic petrochemicals production, expects to produce about 90% of its targeted 1982 output. At the start of the year, the goal was 11.4 million metric tons of basic petrochemicals. Actual production probably will be about 10.2 million metric tons. That's short of the goal, but still 11% higher than last year. More than actual demand, that increase reflects production from new plants that has replaced imports.

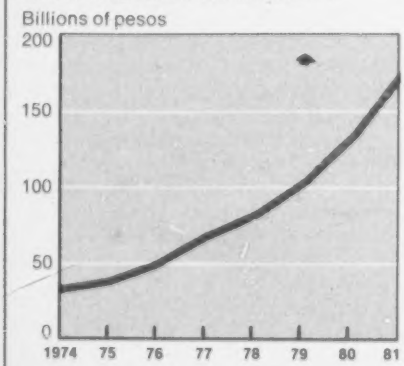
In the downstream, secondary petrochemical industry, where private domestic and foreign capital are permitted to participate, most companies are suffering badly. ANIQ's Pani says that chemical demand has held up better than demand in most other industrial segments, but that's not saying much.

With its import controls and lack of foreign exchange, one of the biggest dangers facing the Mexican government is the possibility of throttling badly needed industrial output that depends upon imports for raw materials. That same problem faces the chemical industry, which relies on imports, not only for many raw materials, but for such critical items as catalysts and plant equipment as well.

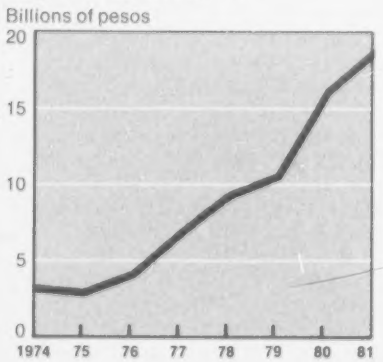
Even though chemicals rate a high priority (behind food) for imports in Mexico, there is very little foreign exchange available (even at the commercial rate of 70 pesos per dollar, much less at the preferred 50 pesos-per-dollar rate) with which to buy chemical imports. Certainly very few Mexican chemical companies themselves have foreign exchange available for foreign purchases.

The exceptions are those few companies that have a fair volume of

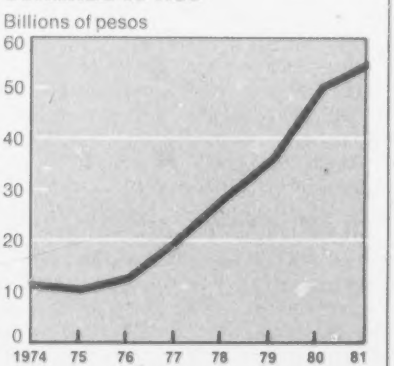
**Despite increased production of Mexican chemicals...**




**...and higher exports of them...**




**...chemical imports continue to rise**




Source: Asociación Nacional de la Industria Quimica

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## LDPE, *p*-xylene dominate Mexico's petrochemical imports

| | 1981 imports of basic petrochemicals | |
|---|---|---|
| | $ Millions | Thousands of metric tons |
| Low-density polyethylene | $108.4 | 126 |
| *p*-Xylene | 100.4 | 148 |
| Styrene | 64.4 | 88 |
| Butadiene | 45.8 | 54 |
| Vinyl chloride | 31.0 | 84 |
| Dodecylbenzene | 29.9 | 33 |
| Ethylene oxide | 25.7 | 31 |
| Acrylonitrile | 14.6 | 20 |
| Propylene | 11.7 | 24 |
| Propylene tetramer | 11.1 | 23 |
| Benzene | 11.0 | 21 |
| Toluene | 9.6 | 23 |
| High-density polyethylene | 8.6 | 10 |
| Ethylene | 7.3 | 15 |
| Isopropyl alcohol | 7.1 | 15 |
| *o*-Xylene | 6.7 | 12 |
| Xylenes | 6.7 | 15 |
| Ethylbenzene | 6.3 | 11 |
| Perchloroethylene | 6.1 | 17 |
| Cyclohexane | 4.9 | 8 |
| Acetaldehyde | 3.7 | 6 |
| Others | 2.4 | — |
| TOTAL | $523.5 | — |

Source: Petroleos Mexicanos

export business and are able to generate their own foreign exchange. Those companies are few indeed.

Mexico traditionally runs a sizable deficit in its chemical trade. Last year, for instance, it imported $2.2 billion worth of chemicals, but exports amounted to only $771 million. Obviously, there's little chance of the industry's generating enough foreign exchange to meet its own requirements.

Lars R. Christianson, director of Christianson S.A. de C.V. and newly elected president of ANIQ, cites the shortage of foreign exchange as one of the chemical industry's biggest bottlenecks. "I don't like them [the exchange controls]," he says, "but I can understand the reasons for them."

He believes that, because of the exchange controls and a stagnant Mexican economy, foreign exchange reserves likely will start building up again. Christianson thinks that, by mid-1983, there probably will be enough available to start importing more. And as imports become more available, they will rekindle the fire under Mexico's economic growth. He sees a real 2 to 3% growth in Mexican GNP starting in mid-1983. That's a far cry from the 7 to 8% increases over the past several years. But it would be a welcome change from stagnation and likely will be enough to allow the chemical industry to start whipping itself back into shape.

The irony is that, although a lack of chemical imports is a problem now, an excess of chemical imports will be the problem when and if Mexico sheds the economic shackles that now bind it.

Import substitution and self-sufficiency long have been goals of the Mexican chemical industry. When Pemex's huge petrochemical complex at La Cangrejera finally is completed next year, it will be able to supply some of the basic petrochemicals that have been imported.

Some, but far from all by a long shot.

In addition to producing all of Mexico's basic petrochemicals, Pemex also imports all of these products, reselling them to downstream customers, usually at a substantial loss. Last year, only two products (low-density polyethylene and *p*-xylene) accounted for 40% of Pemex's basic petrochemical import bill of $524 million. Add only three other products (styrene, butadiene, and vinyl chloride), and the share bounces up to 67%.

By the end of the year, La Cangrejera's 240,000 metric-ton-per-year *p*-xylene unit is expected to be operating. The 240,000-metric-ton low-density polyethylene plant probably will be on stream in the first quarter of 1983, followed shortly by the 150,000-metric-ton styrene unit.

These and other units at La Cangrejera (including a huge 500,000-metric-ton ethylene plant) will help ease Mexico's petrochemical import burden. But if the country's economy does rebound after next year, the output from La Cangrejera soon will be chewed up.

The next major Pemex petrochemical complex will be at Morelos, but the budget cuts are slowing down construction there. Originally due on stream in 1985, Morelos probably will be built now in two stages. The first stage will include the ethylene unit (another 500,000 tonner) and ethylene derivatives, particularly a 100,000-metric-ton high-density polyethylene plant. It may be 1987 before this first stage is complete. The second stage may not come on stream until two years later. This stage will focus on propylene and derivatives, including Mexico's first polypropylene plant.

Meanwhile, two other highly touted petrochemical projects have been put on the back burner. Officially, the Pemex projects at Laguna del Ostion and Dos Bocas have been postponed. How long is anybody's guess. Some say they will be scrapped.

Even if Pemex is able to eliminate basic petrochemical imports completely, which is unlikely, it won't completely solve the country's chemical import problem. These products account for only 23% of the chemical import total. Imports of other chemicals, by companies both inside and outside the industry, account for the rest. And substituting domestic production for these products will take a long time. □

## La Cangrejera complex entirely on stream in 1983

| Thousands of metric tons | Capacity |
|---|---|
| Acetaldehyde[a] | 100 |
| Benzene[b] | 299 |
| Cumene[c] | 40 |
| Cyclohexane | 120 |
| Ethylbenzene | 188 |
| Ethylene[b] | 500 |
| Ethylene oxide[c] | 100 |
| Heavy aromatics | 50 |
| Heptane | 11 |
| Hexane | 35 |
| Low-density polyethylene | 240 |
| *m*- and *p*-Xylene[b] | 370 |
| Nitrogen[a] | 20 |
| Oxygen[a] | 200 |
| *o*-Xylene[b] | 55 |
| *p*-Xylene[b] | 240 |
| Styrene | 150 |
| Toluene[b] | 371 |

a On stream 1980. b Due on stream by end of 1982. c On stream 1981. Source: Petroleos Mexicanos

## Morelos focus on ethylene, propylene, and derivatives

| Thousands of metric tons per year | Capacity |
|---|---|
| Acetaldehyde | 150 |
| Acrylonitrile | 50 |
| Butadiene | 100 |
| Ethane | 705 |
| Ethylene | 500 |
| Ethylene oxide | 200 |
| High-density polyethylene | 100 |
| Hydrogen cyanide | 7.5 |
| Isopropyl alcohol | 75 |
| Methyl-*tert*-butyl ether | 60 |
| Nitrogen | 60 |
| Oxygen | 350 |
| Polypropylene | 100 |
| Propylene | 377 |

Source: Petroleos Mexicanos